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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,487	10/29/2001	Robert Burgess	10015534	7488

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HEWLETT-PACKARD COMPANY  
Intellectual Property Administration  
P.O. Box 272400  
Fort Collins, CO 80527-2400

EXAMINER

RUGGLES, JOHN S

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 12/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/055,487

Applicant(s)

BURGESS, ROBERT

Examiner

John Ruggles

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) 8-21, 24, 46 and 47 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 22, 23 and 25-45 is/are rejected.
- 7) ☒ Claim(s) 36 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant has currently amended claims 1, 5-6, and 22 and added new claims 25-47. However, consideration is limited to applicant's previous election without traverse of Group I, drawn to the process (method for fabricating an article comprising various fabrication steps) of original claims 1-7 and 22-23. Original claims 8-21 and 24 were previously withdrawn from further consideration as being drawn to non-elected inventions. Likewise, new claims 46-47 (reciting a "system for fabricating an article" and comprising various "means", rather than reciting a process comprising various fabrication steps, as was previously elected) are now also withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

### ***Drawings***

The previous objections to the drawings are overcome by the replacement for Figure 6, which was received on 27 October 2003. Accordingly, these previous objections are now withdrawn.

### ***Specification***

The previous objections to the specification are also overcome by current amendments to the specification, which were received on 27 October 2003. Therefore, these previous objections are now also withdrawn.

*Claim Rejections - 35 USC § 112*

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-7, 22-23, and 25-45 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention (as currently amended).

Currently amended claims 1, 5, and 22 and new claims 26, 31, 34-35, and 41 recite a newly added limitation requiring deposition of a uniform layer of photo-activatable building material, which is considered to be new matter. While the originally filed specification supports deposition of a generally thin or thick film of photoresist or photo-activatable building material (page 4, lines 10-14), it does *not* provide specific support for requiring a uniform layer of photo-activatable building material. Claims 2-4 are dependent on claim 1, claims 6-7 are dependent on claim 5, claims 23 and 25 are dependent on claim 22, claims 27-33 are dependent on claim 26, and claims 36-45 are dependent on claim 35.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claim 45 recites the limitation "said transport system", which lacks antecedent basis.

***Claim Rejections - 35 USC § 102***

The previous rejections of claims 1-2, 5, and 22 under 35 U.S.C. 102 are withdrawn due to applicant's amendments of claims 1, 5, and 22. Claim 2 is dependent on claim 1.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Batchelder, et al. (US Patent 5,303,141), especially in view of Lawton (US Patent 5,980,812).

Batchelder describes a process and apparatus for fabricating a three-dimensional solid object by extrusion of light or heat curable building material through a scanning extrusion nozzle orifice as an applicator (e.g., for spraying, etc.) to build up successive layers as shown in Figures 1A and 2A and described at column 4, lines 37-65 and column 5, line 59 to column 6, line 6. Column 6, lines 25-28 describe alternative use of a nozzle applicator having three or more degrees of movement, which may make movement of the building material support table 16 unnecessary (encompassing the raising of the applicator nozzle with each successive layer of deposited building material of instant claim 22). Curing of the building material is initiated as it is extruded from the nozzle orifice by coupling a laser or radiant lamp having an associated

focusing reflector (baffle) to the nozzle (column 7, lines 12-22). For example, the deposited building material is imaged for curing by scanning with a plurality of laser diodes to generate a sheet of light having a thickness corresponding to that of the deposited bead of building material and a width corresponding to the width of the imaging objective (understood to be light focusing lenses coupled to the scanning nozzle along with associated laser diode light-emitting centers (e.g., LED's, etc.), column 9, lines 57-66). Rules for placement of each deposited layer formed from extruded and cured building material can ensure maximum smoothness of each layer before deposition of the next successive layer (column 13, lines 31-51).

While meeting other limitations of instant claims 1-2, 5, and 22, Batchelder does not specifically require depositing uniform layers of building material (instant claims 1-2, 5, and 22) using a printing cartridge that includes an orifice plate (instant claims 3-4). However, it would still have been obvious to one of ordinary skill in the art at the time the invention was made to have used uniform layers of building material, because Batchelder provides rules for ensuring maximum smoothness of each layer of building material before deposition of the next successive layer thereof (instant claims 1-2, 5, and 22).

Lawton shows a process for fabricating a three-dimensional solid object by building up layers formed by ink jet or powder jet technology and subsequent laser diode imaging to cure the building material (column 10, lines 41-42 and column 16, line 32). Ink jet technology encompasses ink jet printing using a printing cartridge that includes an orifice plate for selectively spraying the building material. Alternatively, the building material 105 can be evenly spread or made uniform by sliding a doctor blade 104 having edge 104' over deposited building

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material 106, before imaging by beam 107 to selectively cure areas 108 of uniform layer 106 (see Figure 1 as described at column 6, line 52 to column 7, line 20).

It would especially have been obvious to one of ordinary skill in the art at the time the invention was made to form uniform layers of building material by using a printing cartridge having an orifice plate such as found in ink jet printers to apply or spray the building material followed by smoothing with a sliding doctor blade to form a uniform layer of building material as shown by Lawton; the printing cartridge being modified to include laser diodes and associated focusing lenses at nozzle locations set at predetermined distances from the laser diodes to focus light on the applied building material for curing, as suggested by Batchelder. This is because Batchelder and Lawton relate to the same art of coating and selective curing of successive smooth or uniform layers of building material and because Lawton further shows use of a sliding doctor blade to ensure smooth uniformity of each successive layer of building material before selective curing thereof (instant claims 1-5 and 22).

Claims 6-7 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Batchelder especially in view of Lawton and further in view of Gelbart (US Patent 6,214,276).

While describing fabrication of a solid article by photocuring successive uniform layers of building material using a moving nozzle orifice with coupled laser diodes and focusing lenses, Batchelder and Lawton do not specify additional steps of curing the article (apart from initial curing to solidify each layer) and rinsing non-polymerized building material from the article.

Gelbart teaches a method of fabricating three-dimensional objects using plural laser diodes for selective curing by polymerization of a liquid precursor building material, layer-by-

layer. The initial curing of successive layers to solidify the building material is sometimes followed by baking or UV exposure for further curing and washing to remove uncured, non-polymerized building material (column 4, line 53 to column 5, line 35).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to follow the layered building process as taught by Batchelder and Lawton with additional post-building steps of further curing to harden the solid portions and washing or rinsing to remove non-polymerized building material from the article, as taught by Gelbart. This is because Batchelder, Lawton, and Gelbart all relate to the same art of coating and selective curing of successive layers of building material to form a three-dimensional solid object.

Claims 25-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Batchelder especially in view of Lawton, further in view of Gelbart, further in view of Lin (US Patent 5,764,263), and further in view of Mercer (US Patent 4,029,006).

While describing fabrication of a solid article by photocuring successive uniform layers of building material using a moving nozzle orifice with coupled laser diodes and focusing lenses followed by subsequent additional baking or curing and washing or rinsing to remove uncured building material, Batchelder, Lawton, and Gelbart do not specifically teach automatic transport of the photocured building material to a separate curing unit.

Lin discloses an ink jet printing process and apparatus for reducing curl of a coated substrate (understood to include enhancement of flatness, smoothness, and uniformity of the coated substrate) by coating of single or plural layers (title and abstract). The ink jet printing is preferably carried out with one or more thermal ink print heads 22, 24, 27, and/or 29 (each



understood to have one or more nozzle orifices for ejection of ink heated by firing resistors, which are driven by control circuitry) for selective spraying of coating material onto the substrate (Figure 2 and column 6, lines 56-64). Other suitable types of printing include using a pen plotter, continuous stream ink jet printing, drop-on-demand ink jet printing (e.g., piezoelectric, acoustic, etc. types). Heat may be applied to the substrate  $S_d$  at any location, including before, during, and after application of coating material. Heaters 25, 30, 31, 32, 33, and 34 can be any type of conventional heating means (e.g., lamps, laser diodes, etc.). Figure 2 shows transport of the substrate using advancing device 35, which may include rotating rollers, wheels, transporting device(s) for a belt or platen, and/or guiding gears (column 11, lines 13-46). This advancing device is interpreted to be programmable or automated, being operated in concert with the ink jet print heads and separate heaters in order to achieve desired patterns of cured coating material on the substrate.

Automated control of the transport means for controlled coordination with an ink jet printing head has been known in the art of ink jet printing for some time, as shown by Mercer (abstract, Figure 1, and column 4, lines 35-51).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used an automatic transport between various process stations (including coating, imaging, heating, curing, and rinsing) coordinated with movement of the applicator (ink jet printing head) disclosed by Lin and Mercer in the process of Batchelder, Lawton, and Gelbart. This is because Batchelder, Lawton, and Gelbart all relate to the same art of coating and selective curing of successive layers of building material to form a three-dimensional solid object and also because Lawton, Lin, and Mercer all relate to the same art of coating by ink jet printing.

Claims 35 and 37-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Batchelder especially in view of Lawton, further in view of Kerekes, et al. (US Patent 6,126,884), and further in view of Seki, et al. (US Patent 4,492,966).

Batchelder and Lawton do not specifically teach use of a modified inkjet printing cartridge, which is separate from the material applicator.

Kerekes discloses a process and apparatus for rapid prototyping and fabricating of three-dimensional solid objects by stereolithography (abstract). Multiple ink jet orifices are used to supply building material in order to speed the building process (column 2, lines 19-20). Ink jet orifices are understood to selectively spray the building material. The supplied building material is imaged using laser diodes associated with focusing optics including scanning mirrors, fiber optic cables, and movable lenses as shown in Figures 1c-d and described at column 8, line 13 to column 10, line 58.

Seki teaches a combined modified ink jet printing and laser head recording apparatus. Figure 10B shows a multi-hole ink tank ITY (plural orifice applicator) separate from a laser head LZH that is slidably fitted on a carriage rod Y2, the laser head being controlled by a (computer) processing unit MPU (e.g., using driver circuits, etc., column 7, lines 36-42 and column 8, line 10 to column 9, line 37). Figure 24 shows another embodiment of the recording head, in which an ink jet head having orifices OF1-OF8 is integrally mounted on a carriage CA provided with photosensor elements CD1-CD8 and light emitting diodes (LED's) LE1-LE4 (column 21, lines 50-56). Column 6, lines 8-16 states that semiconductor laser pulses having the same width but increasing amplitude and pulses achieving the same peak temperature but with increasing widths

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both induce or cause emission of larger diameter ink droplets. These embodiments are expected to provide the following advantages in an ink jet recording or coating apparatus: (1) size reduction, (2) increased operating speed, and (3) easier achievement of high-density recording or patterned coating and imaging. Therefore, these and other similar modifications to combine an inkjet printing apparatus or cartridge with light emitting centers (e.g., laser diodes, LED's, etc.) would be expected to provide similar advantages.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have combined a modified ink jet printing cartridge having light emitting centers and a separate applicator having plural orifices as taught by Kerekes and Seki in the process of Batchelder and Lawton, in order to speed the building process as disclosed by Kerekes and also to (1) reduce apparatus size, (2) increase operating speed, and (3) allow easier achievement of high-density patterned coating or building, as taught by Seki.

Claims 42 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Batchelder especially in view of Lawton, further in view of Kerekes, further in view of Seki, and further in view of Gelbart.

While describing fabrication of a solid article by photocuring successive uniform layers of building material using a moving nozzle orifice applicator and a separate modified inkjet printing cartridge having plural light emitting centers (e.g., laser diodes, LED's, etc.), Batchelder, Lawton, Kerekes, and Seki do not specify additional steps of curing the article (apart from initial curing to solidify each layer) nor rinsing non-polymerized building material from the article.

The teachings of Gelbart are discussed above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to follow the layered building process as taught by Batchelder, Lawton, Kerekes, and Seki with additional post-building steps of further curing to harden the solid portions and/or washing or rinsing to remove non-polymerized building material from the article, as taught by Gelbart. This is because Batchelder, Lawton, Kerekes, and Gelbart all relate to the same art of coating and selective curing of successive layers of building material to form a three-dimensional solid object and also because Lawton, Kerekes, and Seki all relate to the same art of coating by ink jet printing.

Claims 43 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Batchelder especially in view of Lawton, further in view of Kerekes, further in view of Seki, further in view of Gelbart, further in view of Lin, and further in view of Mercer.

While describing fabrication of a solid article by photocuring successive uniform layers of building material using a moving nozzle orifice applicator and a separate modified inkjet printing cartridge having plural light emitting centers (e.g., laser diodes, LED's, etc.) followed by subsequent additional baking or curing and washing or rinsing to remove uncured building material, Batchelder, Lawton, Kerekes, Seki, and Gelbart do not specifically teach automatic transport of the photocured building material article to separate curing or rinsing units.

The teachings of Lin and Mercer are discussed above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used an automatic transport between various process stations (including

coating, imaging, heating, curing, and/or rinsing) coordinated with movement of the applicator (ink jet printing head) disclosed by Lin and Mercer in the process of Batchelder, Lawton, Kerekes, Seki, and Gelbart. This is because Batchelder, Lawton, Kerekes, and Gelbart all relate to the same art of coating and selective curing of successive layers of building material to form a three-dimensional solid object and also because Lawton, Kerekes, Seki, Lin, and Mercer all relate to the same art of coating by ink jet printing.

***Allowable Subject Matter***

As allowable subject matter has been indicated, applicant's reply must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

Claim 36 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, as well as correction to overcome all remaining formal rejections and objections.

The following is a statement of reasons for the indication of allowable subject matter: while a method of fabricating an article using photo-activatable building material by successive curing of uniform layers of the building material by imaging with plural light emitting centers (e.g., laser diodes, LED's, etc.) included in a modified ink jet printing cartridge is not new, the more specific limitations in the process of instant claim 36 have not been found in the prior art. The patentable distinctions in this process over those of the prior art are specific modifications to the ink jet printing cartridge, which require (1) the light emitting centers to be formed at or in

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place of the firing resistors of the ink jet printing cartridge, (2) the light emitting centers to be driven by the circuitry for driving the firing resistors, and (3) the light directing devices to be disposed in an orifice plate of the printing cartridge in correspondence with the light emitting centers.

### *Response to Arguments*

On page 19 of the amendment filed on 27 October 2003, applicants assert that newly added claims 25-47 are drawn to the elected invention. Applicant previously elected Group I, drawn only to the process (method for fabricating an article comprising various fabrication steps) of original claims 1-7 and 22-23, without traverse. However, new claims 46-47 are drawn to a “system for fabricating an article” comprising various “means”, rather than a process comprising various fabrication steps, as was previously elected. For this reason, claims 46-47 are withdrawn from further consideration by the examiner as being drawn to a non-elected invention.

The previous objections to the drawings and specification are overcome by applicant's amendment and have therefore been withdrawn.

However, applicant's current amendments to claims 1, 5, 22 and the addition of new claims 26, 31, 34-35, and 41 have introduced new matter for the reasons explained above in a rejection under the first paragraph of 35 U.S.C. 112. Applicant's addition of new claim 45 has also necessitated a new formal rejection under the second paragraph of 35 U.S.C. 112.

The previous rejections under 35 U.S.C. 102 have been withdrawn due to applicant's amendments. All new grounds and any modifications to maintained rejections under 35 U.S.C. 103 have been necessitated by applicant's amendments.

Allowable subject matter has been indicated in claim 36, but applicant must still address all remaining formal requirements as noted above.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection and objection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 703-305-7035. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

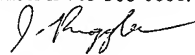
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



John Ruggles

Examiner

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MARK F. HUFF  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700